October 15, 1973

E73-11140
NASA-CR-135699

NASA SKYLAB/EREP
SECOND QUARTERLY PROGRESS REPORT
Contract NAS8-29617 EPN 507

Application of Multispectral Photography to Mineral and Land Resources of South Carolina

"Made available under NASA sponsorship

Submitted by Norman K. Olson, PI

Introduction

Members of our nine-member South Carolina EREP were still awaiting a "first look" at S-190A (70 mm) and S-190B (5-in.) photographs from SL-2 as of the September 20 deadline for this second report.

We did received some 2 1/4 x 2 1/4-in. photography (6 frames each of color and color IR transparencies and 6 frames each of b/w and b/w IR negatives and transparecies), also, 9 frames of 4 1/2 x 4 1/2-in. color transparencies. All areas photographed were part of the Georgia coastline, generally between the cities of Savannah and Brunswick. We assumed that Ground Track 19 (Savannah River valley) was not followed because of an apparently slight westward drift of Skylab.

We have been advised by our Science Support Team (SST) that more SL-2 photographs have been ordered for us. We realize that a combination of factors, chiefly onboard power supply and our local and regional weather conditions over South Carolina, seriously hampered the capability for delivering useful data products.

SL-2 Photographs over Georgia

Our team of Co-I's, two advisors, and the writer took the opportunity of practicing our ability to interpret EREP photographs, even though the scenes did not come within our project area of South Carolina. The largest visible areas were on frames 09-165 (2 1/4 x 2 1/4, color IR) and 01-216 (4 1/2 x 4 1/2, color). Figure 1 is a map of Georgia (USGS, scale 1:250,000) indicating the width of the ground track for each photograph. For positive geographic orientation and comparative annotation the Brunswick sheet (USGS, scale 1:25,000) was used. Frame 09-165 revealed Jekyll Island and the town of Brunswick at the extreme south edge and the southern tip of Ossabaw Island to the north. Frame 01-216 showed the village of Darien and the north half of Saint Simons Island on the extreme south south edge and the southern tip of Ossabaw Island to the north.

Cloud cover over all areas photographed was consistently about the same, averaging 80-90 percent, during June 1973 when all pictures were taken. The northern half of the coastal and inland areas, including the city of Savannah, was constantly beneath dense clouds. Figure 1 indicates an approximate boundary of the opaque cloud cover alone on frames 09-165 (2 1/4 x 2 1/4) and 01-216 (4 1/2 x 4 1/2). All inland areas were cloud-covered to a somewhat lesser degree.

Recognizable features on frame 01-216, in addition to those stated above, include the Altamaha River and Altamaha Sound, Sapelo Island, Saint Catherines Island, Interstate 95 (including interchanges), U. S. Highway 17, and the coastal wetlands. The latter, also called tidelands, marshlands, or coastal zone, are readily detected by EREP photography. The line of demarcation between the intertidal zone and the ground above mean high tide can be mapped easily, especially from the 4 1/2 x 4 1/2-in. transparencies. This fact simply reinforces an already useful application of color infrared

(E73-11140) APPLICATION OF MULTISPECTRAL PHOTOGRAPHY TO MINERAL AND LAND RESOURCES OF SOUTH CAROLINA Quarterly Progress Report (South Carolina State Development) 4 p HC $3.00 CSCL 08G G3/13 N73-33295 Unclas 01140

photography, particularly from a combination of satellites and high altitude aircraft. Widespread controversy still exists in South Carolina over boundaries, ownerships, and proper land use of her tidelands.

Recognizable features on frame 09-165, in addition to those previously mentioned, include the noticeably scoured channels (dark blue) of the Brunswick River and the Hampton River and the accompanying sediment plumes. Jekyll, Saint Simons, and Sea Island all are apparently receiving some natural beach nourishment. The sediment patterns north of Sea Island are obscured by clouds, but it is well known that beach erosion is prevalent in certain areas of the South Carolina coast (although comparable details for the Georgia coast are unknown to the writer).

We plan to study further the tideland features and the high-water boundaries by using a binocular microscope on both sizes of transparencies received. Also, enlargements of frames 09-165 and 01-216 will be used to determine details of vegetation and urban development.

Analysis

A complete analysis, including interpretation of results and other NASA requirements, will be included in the next quarterly report consistent with photography over our South Carolina test sites.

This second quarterly progress report was prepared before the deadline of September 20, 1973, but there were delays in receiving copies of the Georgia map (fig. 1).

Intensive Short Course

In accordance with the Milestone Plan, an intensive short course in aerial remote sensing was held at Clemson University during August 28-29. Professor Donald B. Stafford, Department of Civil Engineering, Clemson Univesity (one of our two EREP advisors) conducted the course. Dr. Stafford prepared a rather extensive compilation of technical data which was bound into individual loose-left notebooks for each student.

The first day consisted entirely of lecture-discussion periods, beginning with the elementary physics of the electromagnetic spectrum and followed by the capabilities and applications of various sensors. Dr. Stafford included the international NASA-ERTS color slide set as part of his afternoon presentation. Dr. Roger A. Holmes, Dean, College of Engineering, University of South Carolina gave a morning lecture on the interaction of the different wavelengths as related to leaf structure and relative amounts of chlorophyll.

The second day was a combination of lecture-discussion which included other sensors, such as radar, and viewing of high-altitude color infrared bulk transparencies of the Atlantic Coastal Plain of South Carolina furnished by the EROS Program Office of the U. S. Geological Survey. Finally, a workshop-display session--using the first package of NASA-selected SL-2 photographs (8 x 10 prints), ERTS-1 images of South Carolina, aerial remote sensing equipment brochures, and other items--concluded the two-day short course.

Summary

SL-2 photographs, received in September 1973 by the South Carolina EREP team (EPN 507), actually covered an area of the Georgia coastline. The 2 1/4 x 2 1/4-inch and 4 1/2 x 4 1/2-inch frames all have an average 80-90 percent cloud cover, but the coastal area from Jekyll Island northward to Ossabaw Island is clearly visible. The northern half of the area, including Skidaway Island and the city of Savannah, was hidden beneath dense clouds. Brunswick and Darien, several highways, and the coastal wetlands can be seen. The most useful application of these photographs is in mapping the high-water mark and other features of the tidelands.

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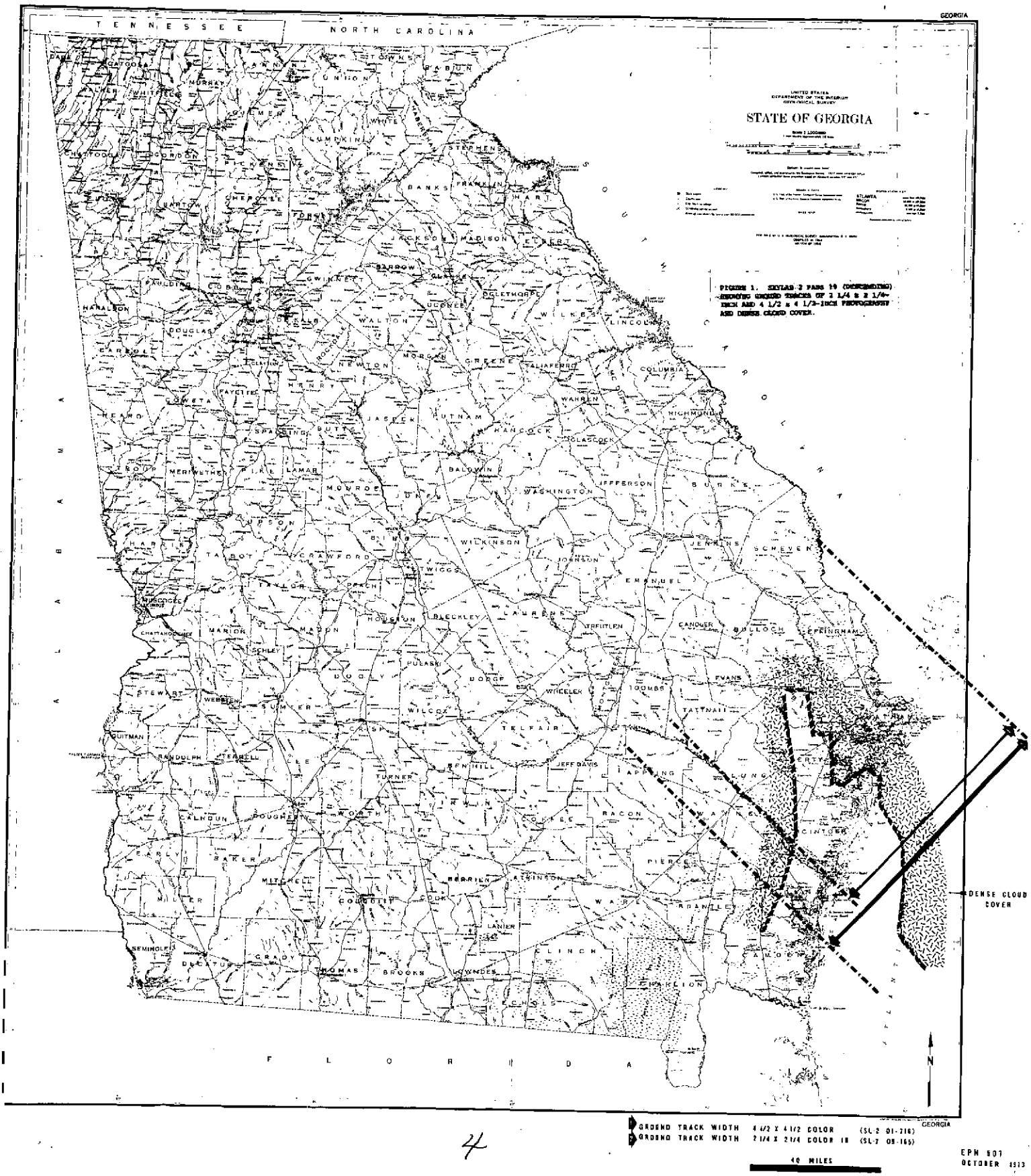
Co-Investigators and Advisors, South Carolina EPN 507



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EPN 507
OCTOBER 1973